

<b>GEARTECH</b>	QUALITY PROCEDURE	No. QP8303	SHEET 1 OF 2	
		Rev. B		
Inspection of Case Depth and Case Hardness		BY RLE	DATE	8/13/02
		CKD JRM	DATE	8/13/02
<div>1. Scope</div> <div>1.1 This procedure covers inspection of case depth and case hardness on representative test coupons for use in monitoring heat treatment of carburized gears.</div> <div>2. Referenced Documents</div> <div>2.1 QP8301 Procedure for Preparing Representative Test Coupons</div> <div>2.2 ASTM E384 Standard Test Method for Microhardness of Materials</div> <div>3. Terminology</div> <div>3.1 Representative test coupon- A coupon designed to represent the cooling rate of the teeth of a particular carburized and hardened gear.</div> <div>3.2 Effective case depth- Distance from the surface of the representative test coupon including oxide scale to where the hardness is 50 HRC by conversion from a microhardness number.</div> <div>3.3 Effective case depth after grind- Distance obtained by subtracting the material removed during grinding of the gear from the effective case depth.</div> <div>3.4 Case hardness- Hardness determined from the hardness gradient at a depth corresponding to the material removed during grinding of the gear.</div> <div>4. Significance and Use</div> <div>4.1 Load capacity- Case depth and case hardness must be maintained within specified values to achieve adequate fatigue strength and fracture toughness.</div> <div>4.2 Process control- Case depth and case hardness vary with material hardenability, quench severity, and heat treat process. Case depth and case hardness measurements are useful for monitoring process control.</div> <div>5. Apparatus</div> <div>5.1 Microhardness testing machine- Either a Vickers or Knoop test machine shall be used.</div> <div>5.2 Standardized test block- A test block certified to 58 HRC hardness and traceable to NIST shall be used.</div> <div>6. Test Specimens</div> <div>6.1 Representative test coupons- Microhardness tests shall be performed on representative test coupons conforming to QP8301.</div> <div>7. Procedure</div> <div>7.1 Indenter load- The indenter load shall be 500 g.</div> <div>7.2 Verification of test machine- The accuracy and repeatability of the hardness tester shall be verified before and after any hardness survey is made. At each verification, five tests shall be taken on the hardness test block. The average reading shall be in the limits of 57.5 and 58.5 HRC. The range of readings shall be within 57 and 59 HRC.</div>				

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7.3	Calibration of test machine- The hardness tester shall be adjusted to maintain accuracy and repeatability within limits for average and range of readings specified in 7.2 Verification.			
7.4	Depth of first indentation- The first indentation shall be 0.1 mm from the surface including oxide scale.			
7.5	Spacing of indentations- Spacing of indentations shall be 0.1 mm.			
7.6	Depth of survey- The microhardness survey shall extend to at least twice the effective case depth.			
8.	Interpretation of Results			
8.1	Hardness gradient- The results of the microhardness survey shall be plotted on a graph of hardness versus depth from the surface.			
8.2	Effective case depth after grind- The effective case depth after grind shall be determined from the hardness gradient by subtracting the material removed during grinding of the gear from the effective case depth.			
8.3	Case hardness- The case hardness shall be determined from the hardness gradient at a depth corresponding to the material removed during grinding of the gear.			
9.	Acceptance Criteria			
9.1	Effective case depth after grind- The effective case depth after grind shall be within the limits specified on the engineering drawing for the gear represented by the representative test coupon.			
9.2	Case hardness- The case hardness shall be 58-62 HRC after conversion from a microhardness number.			
9.3	Hardness difference- The hardness difference between the surface hardness and the maximum hardness below the surface shall not exceed 2 HRC after conversion from a microhardness number.			
10.	Report			
10.1	The report shall include the following:			
10.1.1	Description of the microhardness test machine,			
10.1.2	Indenter load,			
10.1.3	Graph of microhardness survey,			
10.1.4	Effective case depth after grind,			
10.1.5	Case hardness, and			
10.1.6	Hardness difference between surface and maximum value.			